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STUDY OF THE IMPACT OF INTERNATIONAL FINANCIAL CRISIS ON TAIWAN'S GAME INDUSTRY AND INVESTORS

Bi-Huei Tsai
Professor, Department of Management Science,
National Chiao Tung University, Hsinchu 300, Taiwan
E-mail: **bhtsai@faculty.nctu.edu.tw**

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Abstract

Purpose of study: This study investigates the change of stock returns during the Lehman Brother's announcement of bankruptcy in 2008 for the Taiwanese listed video game companies. We further explore the change of stock returns for the Taiwanese listed video game companies after the Taiwan's economy recovers from Lehman Brother's bankruptcy.

Methodology: This study utilizes event study method to statistically test abnormal returns so as to understand whether the Lehman Brother's bankruptcy related event affects stock prices and whether securities prices reflect Lehman Brother's bankruptcy related information.

Main Findings: The results show a significant negative abnormal rate during Lehman Brother's declaration of bankruptcy on Sep. 15, 2008. Investors were affected by financial crisis caused by Lehman Brother's bankruptcy and fully reflected on the stock prices of that day. In addition, our results show that video game companies have significantly positive returns when most Taiwanese electronics firms stop no-pay leave on March 31, 2009. It represents investors were encouraged by this information and fully reflected on the stock prices.

Implications: The results support the efficiency market hypothesis. The pattern of CARs experiences a constant increase and displays the apparent price rise during the announcement of no-pay leave stop. The positive abnormal returns are accompanied by the economic recovery.

Originality/Novelty: This investigation for the frist time chooses the stop of no-pay leave as the indicator of economy recorvery from financial crisis. Our analysis novelly explores the impact of the financial crisis and the economy recovery on the game industry simultaneously and the results show signinficantly different market reactions between the occurance of financial crisis and economy recovery.

Keywords: *Abnormal Return, Cumulative Abnormal Return, Economy Recovery, Video Game industry*

INTRODUCTION

This study investigate the change of stock returns during the Lehman Brother's announcement of bankruptcy in 2008 for the Taiwanese listed video game companies. We further investigate the change of stock returns for the Taiwanese listed video game companies after the Taiwan's economy recovers from Lehman Brother's bankruptcy events. Rodgers (1977) explained that income is the main factor to decide leisure activities and consumers' decision-making. Their participation in leisure activities is subject to the cost of the activity, the needed time, equipment, and traffic factors. Linder (1970) reported that time spent in leisure activities and cost on leisure consumption are the important factor affecting consumers' leisure consumption. Torkildsen (2005) divided the factors affecting people's participation in leisure activities into three categories, i.e. individual, society/environment, and opportunity. Previous literature emphasize the importance of individual incomes in leisure activities.

In mid-September, 2008, after Lehman Brothers went bankrupt, outbreak of financial crisis gradually occurred in many European and US large banks, causing global stock prices fell. On September 15 and 17, 2008, the global stock market value plunged. Global financial markets were turbulent, affecting private consumption and investment confidence. The economy continued to decline in countries around the world during the financial turmoil and the global economy entered a recession cycle. In Taiwan, export orders and overall economy were greatly affected. Domestic and foreign economic growth continued to slow down, thereby affecting employment opportunities in the labor market.

The largest reduction of exports appeared in motors, optical equipment, and electronic products, causing the export value decreased by $360 million compared to the same period of the previous year. In September, 2008, Taiwan presented the first export negative growth in six years. The orders from China and Hong Kong accounting for 23.7% of Taiwan's overall export orders decreased by $ 1.6 billion. Due to poor economy, orders reduced, causing operating losses. Business owners considered reducing personnel costs by pay cuts or layoffs. Some enterprises in which pay cuts or layoffs were not implemented began to implement "no-pay leave." Since July, 2008, the unemployment rate had been over 4%; in July, the unemployment rate was 4.06%; in August, it rose to 4.14%; in September and October, it rose to 4.27% and 4.37% respectively; in December, it rose to 5.03%. Taiwan was influenced by global demand recession, export slowed down.

During the financial crisis in 2008, personal financial resources and income are affected and leisure activities are compressed. Hence, the operations and stock returns of Video game companies are inclined to decrease during this period.

Economics through internet have been getting popular in recent years. Szymanski and Hise (2000) pointed out that consumers can enjoy shopping by staying at home via the Internet. Hoffman and Novak (1994) mentioned that online shopping is characterized by fast, low-cost, cross-border, and informative. Spar and Bussgang (1996) mentioned that the Internet forms a new business world where buyers and sellers can complete transactions at home. Burke (1997) also mentioned that, in addition to convenience, online shopping has complete product information and competitive prices on the Internet from the consumer's point of view. Scansaroli and Eng (1997) shows that online shopping creates new shopping experiences, removes traffic and time factors, and can quickly compare prices and find like-minded people online to discuss online.

Video game industry is one type of the economics through internet. Previous video game related research such as Claussen *et al.* (2012) emphasize electronic game industry is a knowledge-intensive industry, and Cabras *et al.* (2017) prove that regionally knowledge spillover affect the survival rates of video games industry. However, previous studies still lack the impact of financial crisis on video game industry. For these reasons, the first purpose of this study aims to examine whether Video game companies have significantly negative returns during Lehman Brother's declaration of bankruptcy.

In March, 2009, the economic boom in the LCD TV panel industry as well as the semiconductor industry recovered, which was resulted from China's appliances to the countryside. TSMC, UMC, and AUO stopped no-pay leave one after another in March, 2009. Since April, 2009, the number of no-pay leave began to decline. In the end of March, the number of the notified persons on no-pay leave was 219,000. In mid-March, the number of the notified persons reduced by more than 16,000, with the reduction of up to 7%, which was the largest decline since no-pay leave notification stipulated by Ministry of Labor in Taiwan. Since April, 2009, due to emerging urgent orders of semiconductor manufacturers in the industry upstream, upstream manufacturers in the electronics industry stopped no-pay leave one after another. Operating hours of office workers rose and leisure time declined. The second purpose of this research is to examine whether Video game companies have significantly negative returns when most Taiwanese electronics firms stop no-pay leave and recover from the Lehman Brother's bankruptcy crisis

METHODOLOGY

This work utilizes event study method to statistically test abnormal returns so as to understand whether the Lehman Brother's bankruptcy related event affects stock prices and whether securities prices reflect all available Lehman Brother's bankruptcy related information. Event study was first proposed by Ball and Brown (1968) and many papers used to understand the impact of the specific environmental events on stock prices(Jong, Couwenberg, and Woerdman, 2014; Palmquist and Bask, 2016; Tao, Lam *et al.*, 2016; Liu, Gao, and Xia, 2017). If the event is significant, the company's stock price will fluctuate substantially, thus generating the abnormal returns. If the abnormal returns are negative, the specific events contain bad news. On the other hand, positive abnormal returns suggest the good news. Gao, *et al.* (2015) used event study method to find the price decrease and negative abnormal returns before a recall announcement. The advertising interface in product-harm crisis may mitigate the price decline extent. Coulomb and Sangnier (2014) used the event study to examine the the value changes of president candidate connected firms if their supported candidates' victory probabilities increase.

To examine the market reaction to the announcement of the cancellation of no-pay leaves, this study employs the market model to analyze the abnormal returns and cumulative abnormal returns accruing to a stockholder consequence to these events in Taiwan's video game industry. The rates of returns are defined as the price change divided by the beginning prices, so the positive rates of returns are derived from price increases and negative rates of returns are derived from price declines. This paper uses the rate of returns to indicate the price changes during the environment event announcement periods.

This study sets the event day as day 0 for each event. Negative days represent days prior to the event date and positive days represent days subsequent to the event date. The estimation interval is the period from day –60 to day –30 and the forecast interval is the period from day -5 to day 5. For each firm *i*, the market model parameters, $\hat{\alpha}_i$ and $\hat{\beta}_i$, are estimated by regressing each firm's stock returns against the return on market over an estimation period written as equation (1):

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

where $R_{i,t}$ and $R_{m,t}$ are the rates of returns on day t for the *i*th firms and ε_{it} is the residual value. $\hat{\alpha}_i$ and $\hat{\beta}_i$ in equations (1) are estimated using the data during the estimation interval, so we can use equation (1) to figure out the expected returns in the forecast interval. Then, the abnormal returns are calculated as the actual minus expected returns in equation (2):

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$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (2)$$

In equation (2), we compute the abnormal return on day t ($AR_{i,t}$) by comparing the actual return on day t, $R_{i,t}$ to the expected returns $(\hat{\alpha}_i + \hat{\beta}_i R_{m,t})$. Next, cumulative abnormal returns from the 5 day prior to event days to day T_1 (T_1=-5, -4, -3,……, 4, 5) can be expressed as equation (3):

$$\mathrm{CAR}(-5, T_1) = \sum_{\tau=-5}^{T1} AR_{i,\tau} \quad (3)$$

In order to explore whether there are statistically significant abnormal returns on the day when Lehman Brothers' bankruptcy and the stop of no-leaves events occur, this study based on the event day and used the parametric traditional, cross-sectional and non-parametric sign test T-statistics to examine whether the abnormal return on event day is significantly different from zero. The traditional T-statistics is listed in equation (4):

$$T^{\text{traditional}} = \frac{\overline{AR_t}}{\frac{1}{N}\sqrt{\sum_{i=1}^{N}\frac{1}{T-2}\sum_{t=-260}^{-11}\varepsilon_{it}^{2}}} \quad (4)$$

T is the day number of the estimation interval. $\overline{AR_t}$ is the average abnormal return for all the sample firm on day t. $\widehat{\varepsilon_{it}}$ is the residual value, which is the difference between the actual returns and expected returns, during the estimation interval. The cross-sectional T-statistics is listed in equation (5):

$$T^{\text{cross-sectional}} = \frac{\overline{AR_t}}{\frac{1}{\sqrt{N(N-1)}}\sqrt{\sum_{i=1}^{N}(\widehat{AR_{it}} - \overline{AR_t})^2}} \quad (5)$$

Where $\overline{AR_t}$ is the average abnormal return for all the sample firm on day t and N is the firm number. The non-parametric sign test T-statistics is listed in equation (6):

$$T^{\text{Sign test}} = \frac{N_t^+ - 0.5}{\sqrt{\frac{0.5^2}{N}}} \quad (6)$$

Where N_t^+ is the percentage of the observations that their abnormal returns is positive.

SAMPLE

The sample of this study is the nine video game companies listed in Taiwan stock exchange and producing functional fabric. Rates of returns data is obtained from Taiwan Economic News and Taiwan Market Observation Post System. Two Lehman Brother's bankruptcy related events from 2008 to 2009 are collected. The first day is Lehman Brother's declaration of bankruptcy on Sep. 15, 2008. The second event day is March, 31, 2009 when most Taiwanese firms stop no-pay leaves.

RESULTS

Table 1 shows a significant negative abnormal rate of returns during Lehman Brother's declaration of bankruptcy on Sep. 15, 2008 (event date 0). Especially, the average negative return is -2.7970%. The traditional T-statistics achieves a significant level of 1%, cross-sectional T-statistics achieves a significant level of 1%, and the sign test to 1% of the significant level. The finding of the research indicates that announcement of Lehman Brother's bankruptcy causes the negative abnormal returns in Taiwanese game industry. Figure 1 represents investors were affected by this financial crisis information and fully reflected on the stock prices of the financial crisis event. Since September, 2008, there was a monthly expansion on the rate of decline in exports. Until the end of 2008, exports substantially declined by 41.9%. Business operations were impacted by the economy recession. In accordance with 100 large enterprises published by China Credit Information Service Ltd. (CCIS), in first half of 2008, recessions appeared in 69 enterprises; in the second half of 2008, the degree of decline exacerbated. Thus, consumers lacks income to play video game, the stock prices of video game companies decrease substantially. The results are consistent with the BenSaïda (2018) viewpoints that since the financial crisis in 2008, its financial risk impact has gradually spread from the core countries to relevant countries. From the viewpoints, international events occurred will cause the variations of Taiwan's stock prices.

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Table 1 Abnormal returns ($\overline{AR_{it}}$) and T-statistics during Lehman Brother's declaration of bankruptcy

Day	$\overline{AR_{it}}$	Traditional	Cross-sectional	Sign test
-3	-0.1411	-0.1360	-0.1086	0.3333
-2	0.7617	0.7344	1.1399	1.0000
-1	-3.7655	-3.6306 ***	-2.3861 **	-1.6667 *
0	-2.7970	-2.6969 ***	-8.3328 ***	-3.0000 ***
1	-2.0778	-2.0034 **	-5.8693 **	-3.0000 ***
2	-2.5900	-2.4972 **	-1.9014 **	-1.6667 *
3	-2.7446	-2.6463 ***	-2.1888 **	-1.6667 *

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

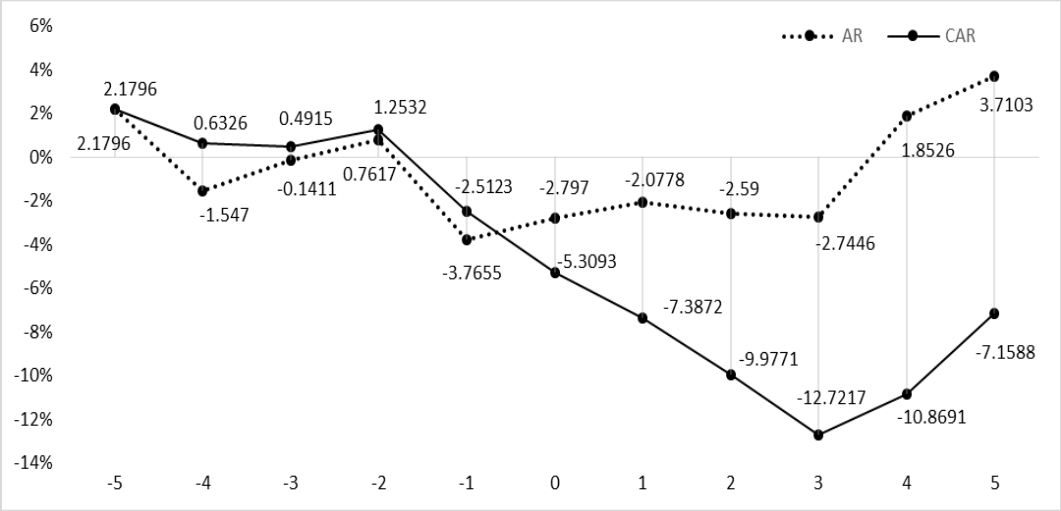

Figure 1 Trajectory of abnormal returns (ARs) and cumulative abnormal returns (CARs) during Lehman Brother's declaration of bankruptcy on Sep. 15, 2008.

Table 2 shows that Video game companies have significantly positive returns when most Taiwanese electronics firms stop no-pay leave on March 31, 2009. The average return is 2.3488% on March 30, 2009 when the companies notice the stop of no-pay leaves. The traditional T-statistics achieves a significant level of 5%, cross-sectional T-statistics achieves a significant level of 10%, and the sign test to 10% of the significant level. It represents investors were encouraged by this information and it was fully reflected on the stock prices of that day. The results support the efficiency market hypothesis.

Table 2 Average Abnormal returns ($\overline{AR_{it}}$) and T-statistics surrounding the period when most Taiwanese electronics firms stop no-pay leave on March, 31. 2009.

Day	$\overline{AR_{it}}$	Traditional	Cross-sectional	Sign test
-3	0.1756	0.1678	0.1247	-0.3333
-2	0.3098	0.2959	0.1912	-0.3333
-1	2.3488	2.2440 **	1.7489 *	1.6667 *
0	0.2947	0.2815	0.3189	0.3333
1	-3.3933	-3.2419 ***	-5.2494 ***	-2.3333 **
2	0.6189	0.5913	0.5634	-0.3333
3	0.6216	0.5939	0.5011	-0.3333

*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

Figure 2 shows that the pattern of abnormal return trend experiences a constant increase and displays the apparent price rise during the no-leave stop announcement. The positive abnormal returns are accompanied by the economic recovery events. Investors regard the event as good news and purchase the stock of Taiwanese viedo game companies substantially; thus, we find the abnormal positive returns for Taiwanese video game companies. The results imply that since March, 2009, due to emerging urgent orders of semiconductor manufacturers in their upstream industry, no-pay leave stopped gradually. Due to economy recovery, the increase in personal financial resources and income stimulate the video game consumption.

The abnormal returns are found in the video game industry during the economy recovers from the financial crisis.

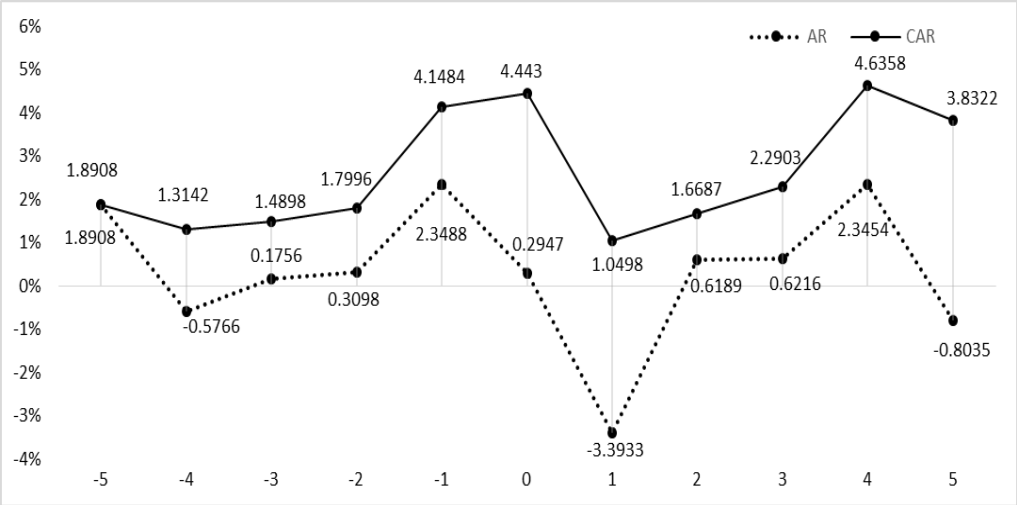

Figure 2 Trajectory of abnormal returns (ARs) and cumulative abnormal returns (CARs) when most Taiwanese electronics firms stop no-pay leave on March, 31. 2009.

CONCLUSION

The results shows a significant negative abnormal rate during Lehman Brother's declaration of bankruptcy on Sep. 15, 2008. It suggests that investors were affected by financial crisis caused by Lehman Brother's bankruptcy and fully reflected on the stock prices. In addition, we find that video game companies have significantly positive returns when most Taiwanese firms recover from the financial crisis, which is caused by Lehman Brother's bankruptcy, and stop no-pay leave on March 31, 2009. It represents investors were encouraged by economy recovery and fully reflected on the stock prices. The results support the efficiency market hypothesis. The pattern of abnormal return trend experiences a constant increase and displays the apparent price rise during the announcement of no-leave stop. The result confirms the positive abnormal returns are accompanied by the economic recovery. This investigation for the frist time chooses the stop of no-pay leave as the indicator of economy recorvery from financial crisis. Our analysis novelly explores the impact of the financial crisis and the economy recovery on the game industry simultaneously and the results show signinficantly different market reactions between the occurance of financial crisis and economy recovery. The viewpoints are the novelty and originality of our study.

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